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A SEASON'S WORK ON THE COLONIZATION IN ONTARIO OF *MACROCENTRUS ANCYLIVORA* ROHWER, A PARASITE OF THE ORIENTAL PEACH MOTH (*LASPEYRESIA MOLESTA* BUSCK.)

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Since the discovery of the Oriental Peach Moth in Ontario in 1925, yearly studies have been conducted to determine the extent to which our native parasitic hymenoptera have transferred their attention to this new source of host material. These studies have disclosed 15 of our native species attacking the Oriental Peach Moth, but as yet, little assistance in the form of actual control has developed from their efforts. During 1929 only 2.2 per cent. of 3298 larvae reared were parasitized by them; thus it seemed advisable to attempt the introduction of species which have proven of major importance in controlling the pest in areas of older infestation.

The history of Oriental Peach Moth infestations elsewhere has shown one of its major control factors in Northern New Jersey to be an ichneumon parasite, *Glypta rufiscutellaris* Cress., and in Southern New Jersey a braconid parasite, *Macrocentrus ancylivora* Rohwer., parasitism by the latter species often running as high as 90 to 100 per cent. *Glypta rufiscutellaris* Cress., is found in our fauna, and is the most abundant of our native parasites; yet in no year, thus far, has it reached such proportions as to be a valuable asset in control. Its early spring emergence indicates the probability of an early alternate host, and its later appearance in the peach orchards may be regulated by the abundance of this native host. This may explain in part the yearly fluctuation of this species. The important southern New Jersey species, *Macrocentrus ancylivora* Rohwer., had not been taken in Ontario. At first it was thought that temperature might limit its northern distribution, but since it was found attacking the Oriental Peach Moth in Connecticut, it appeared probable that it would survive in the Niagara Peninsula climate, and it was decided to attempt its colonization.

Through the courtesy and co-operation of the United States Bureau of Entomology, arrangements were made by the Dominion Entomological Branch to collect the parasite in the Moorestown district of southern New Jersey, where it attacks both the Oriental Peach Moth (*Laspeyresia molesta* Busck) and the Strawberry Leaf Roller (*Ancyliis comptana* Froehl.).

Space for rearing the daily collections was kindly furnished by Mr. L. B. Smith of the Japanese Beetle Laboratory at Moorestown in a section of their Oriental Peach Moth insectary. Thanks are, also, due to Mr. D. M. Daniel of the New York Agricultural Experimental Station at Geneva, New York, for kindly allowing the writer to travel in his car, and for offering valuable information secured in collecting and transporting the parasite in 1928.*

*—In Jour. Econ. Ent., Oct., 1929, Mr. Daniel published an interesting article on this work.

The shortness of the collecting season made it advisable to secure additional help, and three young men were employed to assist in gathering the infested material. During the two weeks spent in this district, 12,000 peach twigs infested with the Oriental Peach Moth, and 15,000 strawberry leaves infested with the Strawberry Leaf Roller were secured. The peach twigs were stripped of their leaves and placed on apples in which the larvae finished their development, later spinning-up in corrugated paper. The strawberry stems bearing the infested leaves were bunched and placed in glasses containing water. New leaves were added as the food was consumed, and at the end of the collecting period most of the material had pupated.

In preparation for the transference of the living material to Ontario, all the Oriental Peach Moth material was placed in 5 lb. tins, the tops of which were sealed with heavy cotton. These tins were then packed in boxes which in turn were wrapped with heavy cotton securely tacked down. The stems of the bunched strawberry leaves were wrapped in damp absorbent cotton and were packed in boxes and covered with heavy cotton. Special precautions were taken to prevent the escape of any of the material while in transit. The trip from Moorestown to Rochester, N. Y., was made at night by automobile, to guard against injury from the extremely high temperatures, thence by boat across the lake to Cobourg, and from here to the Entomological Branch Parasite Laboratory at Belleville, by automobile. On arrival, the boxes were immediately taken to a screened quarantine room and opened, and it was found that the material had survived the trip in excellent condition.



As the parasites emerged at Belleville, they were collected and held at a temperature of 50 F. until several hundred were secured, which required three to four days, and were then transferred to the liberation centers. The shipping cage used was an adaptation from a number of cages developed at our laboratory and the U. S. Corn Borer laboratory at Arlington, Mass. This consisted of a double cage, the inner section of which was constructed small enough to slide within the outer frame which was fitted with a handle and in general the construction resembled a large suitcase. The outer section was made of 20 mesh wire screening on a light wooden frame, and was covered with heavy burlap on the inside, except for the ends. The inner cage was made small enough to allow for a free circulation of air between it and the outer cage, and contained a deep bottom which was

filled with sphagnum moss. This cage was covered with cotton and had a cotton resting place in the form of the letter Z stretched the long way of the cage, which offered the parasites ample clinging surface.

Before putting the parasites in the inner cage, the sphagnum moss was dampened, and before shipment, the burlap on the larger cage was soaked with water. The dampened sphagnum moss offered sufficient moisture for the insects, while the evaporation from the burlap prevented excessive temperatures. The insects were transported in five shipments, four going by automobile, and the fifth by express, the latter leaving Belleville in the evening and arriving at its destination the following morning. Both methods of transportation were equally satisfactory and less than one per cent. of the parasites died in storage previous to shipment and in transit. The parasites were immediately released in the field upon their arrival at St. Davids, Ont.

The two orchards chosen as colonization points, hereafter referred to as point A. and point B., were chosen because they offered entirely different sets of environmental conditions. Point A., located near St. Davids, was protected by highlands just south of the village and was close to large wooded areas. The small orchard used for colonization contained young vigorous trees which showed a twig infestation of almost 100 per cent. Surrounding this point were numerous orchards of various ages offering an abundance of host material. Point B. was on the level plain seven miles north of St. Davids, and, therefore, much closer to the lake, and due to the exposed nature of the district was subjected to almost constant wind currents. The trees here were slightly younger than at point A. and were surrounded by older peach trees in the same orchard. There were very few other young orchards in the near vicinity, and the twig injury was not nearly so high as at the other colonization center. Each point was placed near large strawberry beds where the Strawberry Leaf Roller was available in order to ensure the best possible conditions for establishment and survival of the parasite.

The material yielded 2350 *Macrocentrus ancylivora* Rohwer., for colonization, of which a slightly larger number came from the Oriental Peach Moth collection, and approximately half of these were colonized at each of the liberation points. It should be noted that the season is much earlier in New Jersey and it was possible to collect first generation material there and rear it through for liberation on the first generation of the Oriental Peach Moth in Ontario. Since the life cycle of *Macrocentrus* coincides with that of the Oriental Peach Moth, the parasites were placed in the field at a favourable time for increase during the three summer generations of the host. Immediately after their release, several females were observed examining infested twigs with their antennae, and probing the larval entrance holes with their ovipositors. Most of the parasites, however, took wing and immediately disappeared.

Infested twigs were gathered in the colonization orchards and nearby orchards during each generation of the Oriental Peach Moth and forwarded to the Belleville laboratory where the larvae were reared to maturity being placed in individual vials for observation.

First Oriental Peach Moth Generation.

Collection of infested twigs made in the colonization orchards several days after the liberations yielded 20 specimens of the imported parasite. Large collections of larvae made in the surrounding orchards failed to show the presence of the parasite. Sixteen of the recoveries came from Point A.

Second Oriental Peach Moth Generation.

Twenty-one specimens of the parasite were obtained from the collections in the vicinity of point A. Fifteen of these were taken from the colonization orchard, two from an orchard just across the highway, two from an orchard one mile south-east, one from an orchard one mile west, and one from an orchard two miles west. The recoveries from point A. showed a good establishment in the liberation orchard and considerable dispersal.

No recoveries were secured from point B. during this generation. A collection of 210 twigs was made but due to unfavourable transportation conditions, or other unknown causes, all but 88 of the larvae perished, and these yielded no recoveries. The dispersal collections also failed to show the presence of the imported species.

Third Oriental Peach Moth Generation.

Collections made in, and adjacent to, point A. disclosed a parasite population far exceeding our most optimistic hopes. A small collection made in the colonization orchard showed 99 parasites or a total parasitism of 56 per cent. of the larvae collected. Across the highway, 165 individuals of the parasite were secured from a collection of 341 larvae, which represented a parasitism of 49 per cent. In all the collections made surrounding this point, parasites were secured in greater numbers than in the second generation.

The parasite again made its appearance in the collections made at point B. Forty-eight specimens were taken from the colonization orchard which represented 26.5 per cent. of the total larvae collected. Because of the scarcity of young orchards in the vicinity, the only other collection of the third generation larvae from this region came from an orchard three miles distant. Here 16 parasites, or a parasitism of 12.5 per cent. of the collection, were secured.

Out of a total collection of 1,654 third generation larvae, 380 specimens of *Macrocentrus ancylovora* Rohwer., were secured. This represents a total parasitism for the collections of 22.3 per cent. This figure does not represent Oriental Peach Moth parasitism over the whole collection area, but only the collections which came from twig growth; furthermore it does not include the majority of larvae feeding in fruit and thus beyond the reach of the parasite, but does give an idea of the increase of the imported parasite on available host material.

Unfortunately, the second generation collections had not emerged when the third generation collections were made, otherwise a much greater area would have been included in the work and a more definite idea of the actual dispersal limits secured. The second generation recoveries indicated a spread of over two miles from the colonization point, and it is safe to assume, with a much greater parasite population in the area, that the third generation dispersal would represent a much greater distance.

Summary

The important Oriental Peach Moth parasite, *Macrocentrus ancylihora*, found in 1929 suitable summer breeding conditions in the Niagara Peninsula and multiplied and spread over an approximate area of 35 square miles. As a very small number of the available Oriental Peach Moth larvae were taken in the collections, the parasite recoveries represent a very small percentage of *Macrocentrus* population in the district. Already an appreciable amount of control has been demonstrated at the colonization points and in nearby orchards.

Collections and field observations indicate the probability of the parasite overwintering in either of its available hosts. On the whole, the prospects for the establishment of *Macrocentrus ancylihora* in Ontario are very encouraging and we may, with a reasonable amount of assurance, hope to find in it a valuable aid toward controlling our most serious peach pest.

HETEROPTERA FROM THE NORTH SHORE OF THE GULF OF ST. LAWRENCE.*

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During the summer of 1929, Mr. W. J. Brown collected numerous specimens of Hemiptera at various stations on the north shore of the Gulf of St. Lawrence from Trinity Bay, Que. eastward to the Labrador boundary. Though the number of species obtained is not large, the distributional records are of considerable interest in that they extend the recorded distribution and add further data on the boreal and holarctic tendencies of certain groups. In collecting special attention was given to the Corixidae, three species of which are herein described as new. All localities cited are within the province of Quebec and the material was collected by Mr. Brown and determined by the writer unless otherwise noted.

ARADIDAE

Aradus abbas Bergr.—Natashquan, Aug. 1, 3; Trinity Bay, Aug. 17. A widely distributed species previously recorded by Parshley from the neighbouring region of Newfoundland.

Aradus lugubris Fall.—Natashquan, Aug. 1; Trinity Bay, Aug. 17, 18. A holarctic species described from Finland and recorded from numerous European and North American localities. Parshley records specimens from West St. Modest, Labr. and Godbout, Que.

LYGAEIDAE

Nysius ericae (Schill.)—Natashquan, Aug. 5, 7.

Ischnorrhynchus resedae (Panz.)—Esquimaux Point, June 13; St. Genevieve, June 17; Mascanin, June 19; Mutton Bay, July 11; Natashquan, Aug. 9. This and the preceding species recorded from numerous localities in northern Europe; also of wide distribution in North America.

Eremocoris ferus (Say).—St. Genevieve Isl., June 17.

NABIDAE

Nabis inscriptus (Kirby).—Thunder River, June 8, 11. Described by Kirby from latitude 65° Boreal America. Dr. Harris (Ent. Amer. IX, 70, 1928)

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

defines the known range as including the type locality also Colo., Idaho, Alta., and Alaska.

Nabis flavomarginatus Scholtz.—Natashquan, Aug. 1, 2, 5, 7. A well known north European species hitherto definitely recorded in America only from Alaska, and Slave Lake, Alta., by Harris.

ANTHOCORIDAE

Anthocoris musculus (Say).—Trinity Bay, Aug. 20.

Tetraphleps canadensis Prov.—Harrington Harbor, June 30. A single example of this species which was described from Cap Rouge, Que. Drake and Harris (Can. Ent. LX, 50, 1928) discuss the synonymy and distribution of this species.

MIRIDAE

Stenodema vicinum (Prov.).—Mascanin, June 20.

Trignotylus ruficornis (Geoff.).—Natashquan, Aug. 1. A grass feeding species described from Europe and recorded from many localities in temperate and boreal America including Alaska.

Teratocoris herbaticus Uhl.—Bradore Bay, July 19. The type localities are Hopedale, Labr. and Ungava Bay and the species has also been recorded in Europe from Norway and Sweden.

Phytocoris neglectus Kngt.—Trinity Bay, Aug. 22.

Adelphocoris rapidus Say.—Natashquan, Aug. 9. Plentiful.

Dichroscytus suspectus Reut.—Seven Isls., July 28, 1924 (F. W. Waugh).

Lygus pratensis Linn.—Thunder River, June 11.

Lygus communis Kngt.—Trinity Bay, Aug. 18, 20.

Lygus pabulinus (Linn.).—Trinity Bay, Aug. 18.

Monalocoris filicis (Linn.).—Harrington Harbor, July 4. Common on fern. This species is widely distributed in Europe and America.

Mecomma gilvipes (Stal.).—Bradore Bay, July 19, Macrop. ♂; Trinity Bay, Aug. 18, Brachy. ♀.

Psallus alnicola Doug. and Sc.—Trinity Bay, Aug. 17. Recorded in Europe as feeding on *Alnus rugosa*. Reported in America from N. Hamp., N.Y. and Minn.

Rhinocapsus vanduzeei Uhl. ?—Trinity Bay, Aug. 18, 20, 22.

Plagiognathus politus Uhl.—Trinity Bay, Aug. 20.

Plagiognathus fraternus Uhl.—Trinity Bay, Aug. 20, 22.

Plagiognathus obscurus albocuneatus Kngt.—Natashquan, Aug. 1, 9.

Plagiognathus obscurus Uhl. var.—Trinity Bay, Aug. 20.

GERRIDAE

Gerris remigis Say.—Thunder River, June 10; Trinity Bay, Aug. 18. Common.

Gerris rufoscutellatus Latr.—Mascanin, June 20; Natashquan, Aug. 1, 5, 11.

Gerris buenoi Parsh.—Thunder River, June 10; Esquimaux Point, June 14; Mascanin, June 20; Watshishu, June 18; Natashquan, June 22, Aug. 1, 5.

Gerris incognitus D. & H. (det. C. J. Drake).—Lake Isl., June 28 (wingless).

The first three species of *Gerris* are common throughout Eastern North America: the range of *incognitus* is, however, considerably extended by the present record.

VELIIDAE

- Microvelia* sp.—Trinity Bay, Aug. 22 (a single wingless specimen).
Rhagovelia obesa Uhl.—Trinity Bay, Aug. 17.

SALDIDAE

- Pentacora ligata* Say.—Natashquan, Aug. 2. Fairly common.
Saldula major (Prov.)—Natashquan, Aug. 10; also a specimen Natashquan, June-July 1921 (W. H. Waugh).
Saldula separata (Uhl.)—Trinity Bay, Aug. 17.
Saldula opacula (Zett.)—Natashquan, June 21, a Palaerctic species recorded in America from Maine and Mass.
Saldula interstitialis (Say).—Natashquan, June 22-Aug. 10; Little Mecatina Isl., July 6; Harrington Harbor, July 4; Mecatina Sanctuary, July 9; Thunder River, June 11; Trinity Bay, Aug. 17; Bonne Esperance, July 14. A series of this species taken; the specimens are referred to the *interstitialis* group and are probably conspecific with Say's species.

NOTONECTIDAE

- Notonecta borealis* Bueno and Hussey—Natashquan, Aug. 8. Common.

CORIXIDAE

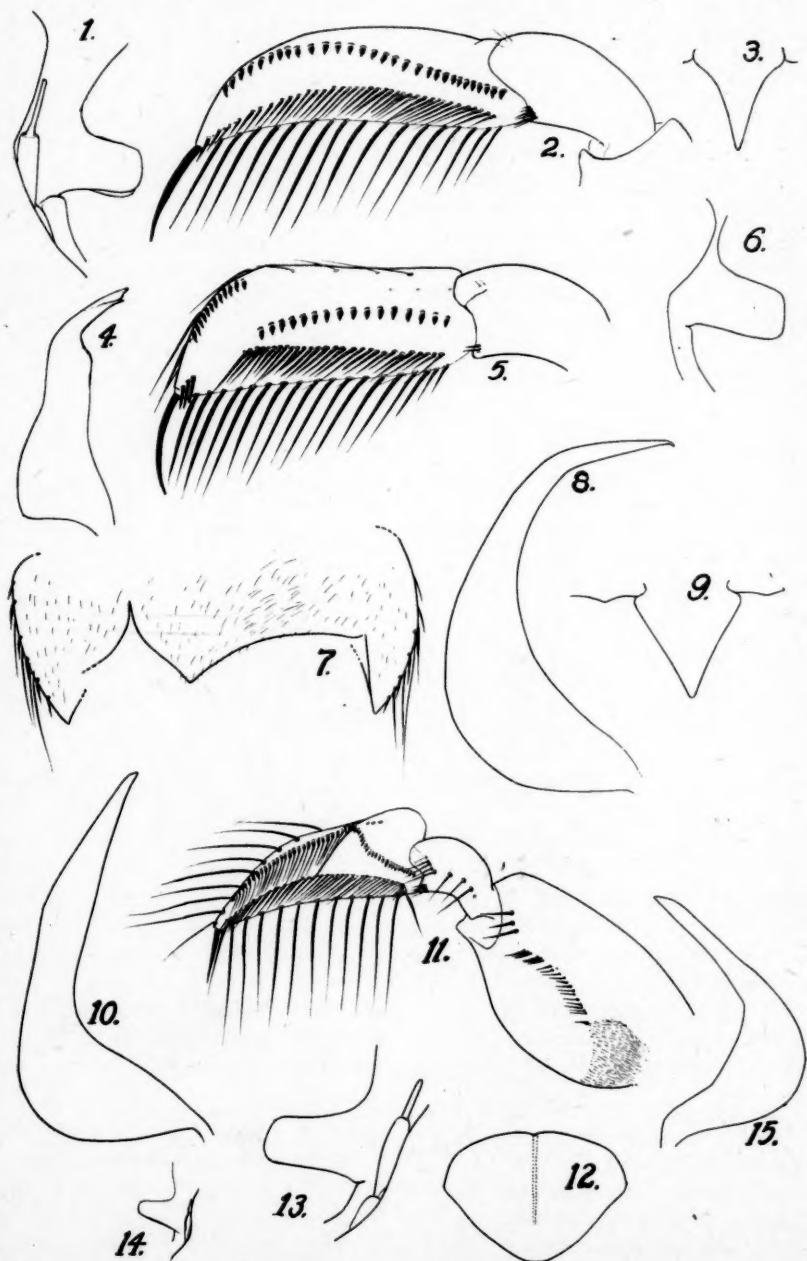
- Arctocorixa decoratella* Hungfd.—Watshishu, June 18; Natashquan, Aug. 11. Rare. The species was described from Northern Michigan. I have seen specimens from Ontario, Manitoba and Northern Alberta.
Arctocorixa seriata Abb.—Eleven specimens obtained at Natashquan, June 21, 22, Aug. 5, 11. The species has hitherto been known only from the New England States.
Arctocorixa chanceae Hungfd.—Watshishu, June 18; Mecatina Sanctuary, July 9; Greeneley Isl., July 20; Bradore Bay, July 27. Described and recorded formerly only from the Kobuk River, Alaska. Apparently closely related to *A. convexa* (Fieb.) which was described from a female, Nain, Labrador.
Arctocorixa convexa (Fieb.)—Thunder River, June 10; Musquaro, Bragg Harbor, June 24; Wolf Bay, June 25; Fog Isl. Sanctuary, June 25; Bonne Esperance, July 14. Specimens at hand agree very well with Fieber's description of a female which he named *Corixa convexa* (Spec. Gen. Corisa, p. 37, 1851). Fieber gives the following information concerning his type specimen "Habitat in America boreali, Labrador in littorale prope Nain (Mus. Hal.!)." The writer has also studied two males and two females from the Bueno collection, collected at Cape Charles, Labrador.

Since the male of this species is underscribed the following description and figures are presented based on a male specimen (Musquaro, Bragg Harbor, Que., June 24, 1929, W. J. Brown) in the Canadian National Collection.

***Arctocorixa convexa* (Fieb.)**

Figs. 1, 2, 3, 4.

Male.—Length 11 mm. Head with anterior margin produced, rounded between eyes. Face strongly depressed meeting the prominent vertex at a right angle. Pronotum long, produced behind with a median longitudinal carina strongest on anterior half but faintly indicated at apex, moderately rounded, rastrate, with numerous transverse impressed lines. Lateral lobe of prothorax slightly longer than broad. Metaxyphus acutely pointed attaining middle of hind coxae.



Pala with a single row of pegs and a strong terminal spine. Clavus and basal half of corium more finely rastrate than pronotum, smooth beyond. Corium with numerous whitish silky appressed hairs. Membrane large, shining. Male clasper as in figure 4. Strigil large, broad, with about 18 rows of striae.

General color blackish. Vertex brownish, face dirty yellow. Front femora yellowish with a brown spot at base. Mid and hind femora dirty yellowish on basal half, faintly darkened beyond. Remainder of mid and hind legs light brownish, the apices of the mid tarsi narrowly blackish. Upper margin of pro- and meso-pleura and hind angles of meta-pleura yellowish. Thoracic venter and coxae black. Basal two abdominal sternites wholly black the remainder black with apices pale. Disk of pronotum with 12-13 dirty yellowish cross bars, the median ones slightly broken or furcate. Clavus with transverse yellowish bars, broader and more clearly defined at base, becoming broken and more irregular near middle. Corium with numerous small irregular pale marks which arrange themselves in four obscure longitudinal series on the disk. Membrane with similar pale flecks not in series, most distinct and regular along the inner margin. Embolium brownish throughout.

This species has much the same general facies as *A. chanceae* Hungfd. In the form of the male frontal depression, the shape of the pronotum, the presence of a percurrent carina, number of pronotal cross lines, general color and markings, the two species are quite similar. The pale flecks on the tegmina of *chanceae* are more distinctly arranged in series. In the males the form of the pala will at once distinguish the two species. In *chanceae* the pegs are arranged in a short basal and a longer upper submarginal row. The right male clasper is distinctly bifid in the Alaskan species and only incipiently so in *convexa*. However, the general form of the clasper is distinctly of the same type in both species and the modification appears to be only one of degree. The size of *chanceae* is also considerably less in both sexes than in *convexa*. The former species is described and illustrated by Dr. H. B. Hungertord (Ann. Ent. Soc. Am., XIX, 461, 1926).

Arctocorixa spp.—♀, Harrington Harbor, July 3. ♀, Natashquan, June 21. These two females represent two species distinct from the *Arctocorixas* discussed above. In the absence of males I am unable to assign them specific names.

Callicorixa alaskensis Hungfd.—Thunder River, June 10; Watshishu, June 18; Musquaro, Bragg Harbor, June 24; Harrington Harbor, June 30; Little Mecatina Isl., July 6; Mecatina Sanctuary, July 8; Bradore Bay, July 27; Natashquan, June 21, Aug. 3, 8, 11; Mutton Bay, July 11. Plentiful.

This is another Alaskan species new to the east. The male genitalia are characteristic and distinct from the apparently closely allied Palearctic species treated by Lundblad (Ent. Tidsk., XLVIII, 57-97, 1927).

I have also at hand a small series of *Callicorixa* which from casual observation I took to be *pracusta* Fieb. Thanks, however, to Lundblad's excellent figures illustrating structural details of *pracusta*, I have been able to segregate my specimens from that species. The form I have is described as follows:

Callicorixa canadensis n. sp.

Figs. 5, 6, 7, 8, 9.

Male.—Length 7 mm. General form and color pattern very similar to *C. alaskensis* Hungfd.

Facial depression of male less pronounced than in *alaskensis*. Pronotum, corium and clavus rastrate. Pronotum with only a very faint median carina on anterior fourth, posterior margin rounded. Metaxyphus slightly less acute than in *praeusta*. Lateral lobe of prothorax longer than broad, truncate. Front legs much as in *C. producta* Reut. but the femora without the patch of long hairs. Palae with pegs in two rows arranged as in *alaskensis*. Right clasper slightly less curved than in *praeusta* and much less so than in *alaskensis*. Seventh abdominal tergite lacking the right marginal projection present in *praeusta* and with the curve of the posterior margin broader and the caudal projection obtuse and to the left of the median line.

Color dark, head dirty yellow suffused with brown. Legs yellowish brown, the hind basi-tarsi uniformly yellowish not with a black quadrate spot or the distal half black as in *praeusta* and *alaskensis*. Pronotum and elytra marked as in *alaskensis*.

Holotype.—♂, Natashquan, Que., Aug. 3, 1929 (W. J. Brown); No. 3096 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data as holotype.

Paratypes.—2 ♂♂, same data as holotype; 2 ♂♂, Mascanin, Que., June 20, 1929; 2 ♂♂, Kazubazua, Que., Aug. 28, 1929 (Brown and Fish).

Glaenocorixa quadrata n. sp.

Figs. 10, 11, 12, 13.

Closely related to *G. cavifrons* Thoms. of Europe.

Male.—Length 8.5 mm. Head from above three-arched as in *G. cavifrons*. Pronotum with a strong median carina except at posterior third; posterior margin slightly produced, more angularly rounded than in *cavifrons*. Lateral lobe of prothorax produced, margins sub-parallel, apex truncate. Pronotum, clavus and base of corium rastrate. Metaxyphus in shape of an equilateral triangle. Femora with lower margin dilated, thus carinate at middle, above which on inside is a smooth flattened area lined above by an irregular row of short spines. Inner face of tibia with a row of 4 or 5 rather long spines. Pala four edged as in *cavifrons*, the row of stridular teeth attaining the upper margin in region of basal third. Strigil and clasper of the same general form as in *cavifrons*.

Head above brownish, face yellowish suffused with brown. Legs dirty yellowish brown, the front legs somewhat paler. Venter blackish the abdominal sternites narrowly pale at apices. Pronotum brownish black with 9-10 slightly confused dirty yellowish cross lines. Clavus with a few irregular pale bars on basal third separated by much broader black spaces, beyond with interrupted transverse flecks. Corium and membrane with scattered yellowish flecks which do not form rows or series, the blackish ground color predominant.

Holotype.—♂, Harrington Harbor, Que., July 3, 1929 (W. J. Brown); No. 3097 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data as holotype.

Paratypes.—♀, Mecatina Sanctuary, Que., July 9, 1929; ♀, Bonne Esper-

ance, Que., July 14, 1929; ♀, Bradore Bay, Que., July 27, 1929 (collected by W. J. Brown).

Notes: This species bears a close resemblance to *G. cavifrons* Thoms. The different arrangement of paler pegs and the shape of the lateral prothoracic lobe will separate the two species. *Cavifrons* is fully figured and described by Jaczewski (Ann. Zool. Mus. Polonici Hist. Nat., III, pp. 26-29, 1924).

This is the first record of a typical *Glaenocorixa* from North America. The writer has not studied specimens of *Glaenocorixa hybrida* Hungfd., an aberrant species described from Minnesota and provisionally placed in this genus by Hungerford.

Trichocorixa fenestrata n. sp.

Fig. 15.

Male.—Length 4 mm. Slender with the general aspect of a small *Palma-corixa*. Face moderately flattened for the genus. Pronotum with posterior margin angulate. Disk somewhat shining very faintly rastrate. Elytra shining. Palae short, subtriangular with about 16 pegs in a single curved row.

Head yellowish, vertex with three broad fuscous lines which sometimes fuse to form a median blotch. Venter and legs pale yellowish, apex of mid-tarsi brownish; hind tibiae and tarsi pale brownish. Pronotum with 8-10 transverse blackish lines the median ones furcate and somewhat confused. Clavus with transverse blackish bars which may be slightly confluent or furcate at either end but are not sufficiently confused to lose the bar-like appearance. Corium and membrane with blackish bars, these more confluent so that bar-like pattern is lost, being replaced by a more or less even reticulation of yellow and black.

Holotype.—♂, Natashquan, Que., Aug. 9, 1929 (W. J. Brown); No. 3098 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data as holotype.

Paratypes.—15 ♂♂, 15 ♀♀, same locality and collector, Aug. 7-9.

The females are noticeably larger than the males but otherwise differ only sexually.

The specimens (some of which were quite teneral) were observed in large numbers in blackish wave worn pools along the tidal line of the seashore. Large numbers of nymphs were also present.

This species appear to be close to *T. burmeisteri* (Fieb.) described from "America boreali."

EXPLANATION OF PLATE IO.

A. convexa (Fieb.); 1. lateral prothoracic lobe; 2. ♂ pala; 3. metaxyphus; 4. ♂ clasper. *C. canadensis* n. sp.; 5. ♂ pala; 6. lateral prothoracic lobe; 7. seventh tergite of ♂; 8. ♂ clasper; 9. metaxyphus. *G. quadrata* n. sp.; 10. ♂ clasper; 11. ♂ pala; 12. pronotum; 13. lateral prothoracic lobe. *G. cavifrons* Thoms.; 14. lateral prothoracic lobe (redrawn from Jaczewski). *T. fenestrata* n. sp.; 15. ♂ clasper. (Note—figures not drawn to same scale).

MORTALITY OF *POLISTES ANNULARIS* WASPS DURING HIBERNATION.

BY PHIL RAU,
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In "Wasp Studies Afield" we recorded the enormous mortality of these hibernating queens in the crevices of rocky bluffs. Since that record was made, on half a dozen different occasions, I have found handfuls of dead wasps on the

window-sills of several club-houses. On October 20, 1920, I brought home one hundred live queens of *P. annularis* all taken from nests, and fed and sheltered them, hoping that they would hibernate so I could observe them at close range. By October 28, twenty-two had died; by November 8 only seven were alive; on November 25, only four survived, and by December 2 all were dead. It is perhaps not surprising that the mortality should be so heavy, but I certainly was surprised to see it make a clean sweep so early in the season—before the rigor of winter had time, really, to touch them. It is true that these were kept indoors, and the conditions may not have been the same as in their natural quarters, but the winter was unusually warm, so that one might almost have expected the same results to occur in nature. I believe that cold winters are better for the hibernating queens than mild ones, for during occasional warm days of winter they will venture out and fly about, and expend their vital forces which at that time they have no means of replenishing, and then, when cold weather comes they are unable in their weakened condition to continue their metabolism and survive. They love the sunlight and, following its lure, yield easily to the temptation to venture out to bathe themselves in it. Once out, they become very active. When I saw thousands of *P. annularis* flying happily about on February 28, I could not help thinking that they were expending precious stores of energy that could not be replenished, since at that time no food was available, nor would it be in the near future or at the time of their dire need. I am sometimes inclined to think that this behavior is the cause of the great mortality previously recorded. They frisk about during premature warm days, rehibernate and then with lessened vitality, are unable to withstand the subsequent cold weather. It is a case almost analogous to that of the fruit-trees that are lured by the premature sunshine into blossoming too early, and then are killed by the frost.

The tragic side of these winter deaths is portrayed by an instance where many *P. annularis* sought shelter for the winter behind a shutter, and when the cold weather came, crawled head first, as far as they could, into the cells of a paper nest of *P. pallipes* which was attached to the wall. They even sought out the most protected cells, but only to perish in the trap. They did not choose a place sufficiently protected from the cold. How did they differ from the thousands that were out flying about, which had chosen adequate hibernating quarters? Instinct urges the wasps to hibernate, but it needs more than instinct to find a spot which will afford adequate cover.

In the spring one often finds dead *annularis* near their crevices, still soft and limp, showing that they have survived the rigors of winter only to die at the awakening of spring. In the fall they often do find a straggling blossom, for I have a record of *pallipes* feeding on aster flowers as late as October 19. Whether they fill up sufficiently on food before hibernating is doubtful; at any rate, they were very hungry on February 26; the nineteen brought to the laboratory ate ravenously of apples; however all but four of these died within a month.

This material would work up beautifully for a problem in selective elimination, if the wasps, both dead and alive, were gathered, subjected to measurements, and the characteristics of the survivors noted. It may well be, however, that such results would not mean much because the survival value in *P. annularis* is probably psychological rather than physical, but it is likely after all that measure-

ments will show that those which have stored up the greatest amount of adipose tissue survive in spite of the various extremes in the temperature of a Missouri winter.

VESPULA INTERMEDIA (BUYSS.) IN MANITOBA.

BY FERRIS NEAVE,

University of Manitoba.

In his "Monographie des Guêpes," published in 1904-05⁽¹⁾, R. du Buysson describes a new form under the name of *Vespa rufa*, var. *intermedia*. His description was based on material in the Paris and British Museums and the localities given are Lake Hanka in Manchuria and Hudson's Bay. I am not aware of any subsequent records in North America. It is not mentioned in Sladen's paper on Canadian social wasps⁽²⁾—an omission which it shares with other species—nor does it appear in the records of the Harriman Alaska Expedition or the Canadian Arctic Expedition. It seems worthy of note, therefore, that the writer found a wasp which agrees fairly well with du Buysson's brief description at Mile 137, Hudson's Bay Railway on August 27th, 1928. Three specimens were caught (a male and two workers) and others were seen, frequenting the flowers of *Epilobium*. It is a handsome form, black with white markings and with conspicuous red areas on the first two abdominal segments. The latter color is so striking that the species can be recognised readily, even when on the wing. As the worker was unknown to du Buysson, a brief description of this caste is given:



Fig. 1. Apical portion of left stipes of (a) *Vespa intermedia* (b) *V. consobrina*, seen in ventral view.

Scape of antenna with a narrow whitish streak in front; clypeus with a black, apically widened stripe; white color behind the eye less extensive than in the male. Two small white spots on the metanotum in addition to those on the scutellum. Basal abdominal segment with a small black spot in the middle of the red color. The red patches on the second segment are immaculate, whereas in the accompanying male each contains a small white spot. Coloration otherwise similar to the male.

Vespa intermedia is a well-marked species according to modern taxonomic valuations, distinguishable from the other American members of the *rufa* group not only by the very distinct coloration but also by the form of the male genitalia. Since the latter have not been described very adequately a partial figure is given

1.—Buysson, R. du. Monographie des Guepes, Ann. Soc. Ent. France, LXXIII, 485-556, 565-634, 1905.

2.—Sladen, F. W. L. The genus *Vespa* in Canada, Ottawa Nat., XXXII, 71-72, 1918.

(Fig. 1) together with a similar portion of the organ of *V. consobrina*, a common member of the *rufa* group.

NEW SPECIES OF DOLICHOPODIDAE FROM NORTH AMERICA
AND THE WEST INDIES.

BY M. C. VAN DUZEE,
Buffalo, N. Y.

***Thinophilus pruinosis* n. sp.**

Male: Length 2.6-3 mm. Head, thorax, abdomen, legs and feet thickly white pruinose, but the ground color showing through; face moderately wide, wholly pollinose, this pollen yellow in the middle, reaching the orbits at the suture, sides of upper part narrowly, below the suture widely white pollinose, sometimes the yellow pollen covers most of upper part and extends onto the inner part of the palpi; palpi with snow white pollen, each nearly as large as upper part of face; antennae wholly yellow, small, arista whitish; orbital cilia white, rather long on the sides; occiput, front, thorax and abdomen reddish coppery, posterior margins of abdominal segments sometimes green; bristles of thorax small, black; hairs of abdomen very short, white; pleura and coxae black with ground color nearly concealed with white pollen, tips of coxae yellow; hypopygium small, with a long, straight, black appendage extending forward under the abdomen and small yellowish appendages inside of this long one; femora, tibiae and tarsi pale yellow, last two joints of all tarsi blackish; the minute hairs on all femora and tibiae white, the small bristles on tibiae black; fore tibiae with a row of long white hairs on upper surface, which are as long as diameter of tibiae and extend to fourth tarsal joint, becoming shorter towards the end; apical joint of middle tarsi very slightly widened; pulvilli not enlarged; joints of fore tarsi as 20-8-6-5-7; of middle ones as 32-14-9-6-6; joints of posterior pair as 25-19-11-6-7. Calypters and halteres pale yellow, cilia of former white; wings slightly tinged with whitish, veins and costa yellow; third and fourth veins nearly parallel, slightly arched, fourth ending in apex of wing; last section of fifth vein nearly twice as long as cross-vein.

Female: Length 3.5 mm.; color as in the male, face slightly wider; fore tibiae and tarsi without long hairs above.

Described from four males and three females, taken by the author, May 24, 1926, at Grand Junction, Colorado.

Type in the author's collection.

***Chrusotus arkansensis* n. sp.**

Male: Length 2.5 mm. Face narrow with parallel sides, face and front green with white pollen, which does not conceal the ground color; palpi black; antennae wholly black, third joint small, pointed at tip, as long as wide, second joint about as long as third; arista apical; lower orbital cilia white.

Thorax shining green with bright bronze reflections, when viewed obliquely a little dulled with white pollen; scutellum blue; all bristles of thorax yellow. Abdomen green or blue-green with coppery reflections; hypopygium small, black, appendages small, black.

Coxae black, anterior pair yellow on apical half, nearly bare; femora black with yellow tips, fore femora yellow on apical half, sometimes basal half only

slightly brown, in other specimens black; tibiae and tarsi pale yellow, tarsi blackened at tips; legs and feet rather long and slender. Calypters and their cilia yellow; halteres black.

Wings with a whitish tinge, veins yellow, attenuated; third and fourth veins nearly parallel; last section of fifth vein straight, fully twice as long as cross-vein, which is slightly beyond the middle of the wing.

Described from six specimens, taken at Fayetteville, Arkansas, between May 31 and July 9, 1906.

Type No. 32, University of Arkansas Collection.

***Hercostomus (Gymnopternus) pallidiciliatus* n. sp.**

Male: Length 2.3 mm. face and front white pollinose, wholly opaque, face rather narrow; palpi and proboscis brown; antennae reddish yellow, first joint more brown, third joint large, nearly twice as long as wide, rounded at tip, but not darkened; the orbital cilia seems to be wholly black and very short.

Thorax and abdomen green, a little dulled with gray pollen, abdomen with slight bronze reflections; hypopygium moderately large, black, yellowish below, its lamellae whitish, narrow, fringed with black hairs.

Coxae yellow, middle and hind ones a little grayish on outer surface at base, anterior pair with a few black hairs; femora, tibiae and tarsi yellow, tarsi scarcely darker at tip; joints of middle tarsi as 35-21-12-10-8; of posterior pair as 23-28-19-13-9; fore tibiae and tarsi of about equal length. Calypters, their cilia and the halteres pale yellow.

Wings dark grayish; third and fourth veins nearly straight and parallel, fourth ending just back of apex of wing; last section of fifth vein but, little arched, twice as long as cross-vein.

Female: Like the male in color; face wider; third antennal joint about as long as wide, pointed at tip.

Described from one pair, taken by Hough, at New Bedford, Massachusetts. Holotype No. 35, University of Arkansas Collection.

This male is very much like *opacus* Loew, but in that species the third antennal joint is pointed at tip and cilia of calypters black; while in this the third antennal joint is broadly rounded and cilia of calypters pale yellow.

***Pelastoneurus seticauda* n. sp.**

Male: Length 3.5 mm. Face wide, silvery white; front blue-green; palpi yellowish, black at base; first and second antennal joints yellow, third dark brown, broadly rounded at tip, longer than wide; occiput green with white pollen; orbital cilia wholly black, that on the sides very short.

Dorsum of thorax largely violet, the edges green, dulled with brownish gray pollen, except in front; scutellum violet; pleura green dulled with white pollen; the black stripe above root of wings is not very conspicuous; there is a spot of white pollen at the suture and another above the root of wings. Abdomen blue-green, dulled with white pollen, which is very thick on the sides; last segment wholly white pollinose; hairs of abdomen black; hypopygium large, nearly sessile, black, cut off abruptly at apex, its lamellae black, long and quite wide, widest near the base, but narrowed into a short, yellow petiole, pointed at tip, they have many long, black bristles on upper surface (when extended forward under the venter), lower surface white pollinose and covered with little black hairs; a pair

of inner appendages are horn-like, smooth, two thirds as long as outer lamellae, and with extreme tip bent hook-like.

Fore coxae yellow, blackened at base nearly to middle, their hairs black; middle and hind coxae black; all femora and tibiae yellow, extreme tips of hind femora and base and tip of hind tibiae black, at least above; middle tibiae with one bristle at middle, hind ones at apical fourth, of lower anterior edge; fore tarsi wholly yellow; middle tarsi black from tip of first joint, hind ones wholly black; joints of middle tarsi as 36-22-13-11-10; of hind ones as 31-43-32-17-14. Calypters and halteres yellow, cilia of former black.

Wings grayish; last section of fourth vein bent near its middle, this bend broadly rounded; costa not thickened; last section of fifth vein as 27, cross-vein as 17 fiftieths of a millimeter long.

Described from one male, taken at Atherton, Missouri, June 24, 1902. Holotype No. 38, University of Arkansas.

This is something like *occidentalis* Wheeler, it differs in having the orbital cilia wholly black and the hypopygial lamellae broader.

***Diaphorus insulanus* n. sp.**

Male: Length 2.6-3 mm. Face wide, its sides parallel, a little longer than wide, silvery white; eyes contiguous, obliterating the front; antennae black, third joint not much more than half as long as wide, rounded with a notch for the insertion of the apical arista; palpi and proboscis black; orbital cilia white, below the head are numerous long pale hairs and a few shorter black ones.

Thorax green, rather dull, scutellum blue or bronze color. Abdomen green or coppery, rather dull, its hairs partly pale in color; venter a little yellowish with long pale hairs; tip of abdomen with four strong bristles; hypopygium black, its lamellae small, triangular, brown or yellowish brown, often concealed.

Coxae black, anterior pair a little yellowish brown with white hair and black bristles at tip; femora black; fore trochanters, all tibiae and base of all tarsi yellow, tarsi becoming more or less black towards tips; legs and feet long and slender; fore pulvilli enlarged; joints of middle tarsi as 41-18-9-8-5; of hind ones as 27-20-12-7-6. Calypters brown with black cilia; halteres black.

Wings grayish; third and fourth veins parallel, a very little arched; last section of fifth vein twice as long as cross-vein.

Described from four males, taken by H. H. Smith, on St. Vincent Island, West Indies, one is labeled May and one Perseverance Valley, 1,000 feet elevation.

This is much like *gibbosus* Van Duzee, but in that species the face is black, in this silvery white; the abdomen is also metallic in this, while in *gibbosus* it is almost velvety black.

***Thrypticus parvulus* n. sp.**

Male: Length 1.2 mm. Face and front blue or violet, the former narrow; antennae yellowish red. Thorax dark green with blue reflections in front; depressed space before the scutellum with bronze reflections; all hairs and bristles of head, thorax and abdomen yellow. Abdomen green with coppery reflections; hypopygium small, black, its lamellae rather long, narrow, somewhat oval but pointed at tip, hairy, less than half as wide as long; comparative length of hypopygial parts are, petiole as 6, capsule of hypopygium as 9, lamellae as 7. Coxae, legs and feet yellow.

Wings yellowish gray, veins yellow; third and fourth veins nearly parallel, fourth ending in apex of wing; last section of fifth vein as 17, cross-vein as 5.

Female: About like the male in color, size, and wing characters.

Described from one pair, taken by H. H. Smith, March, on St. Vincent Island, West Indies, at 500 feet elevation. Holotype No. 34, University of Arkansas Collection.

This is very much like *aurinotatus* Van Duzee, from Georgia, but that species has the lamellae much wider and rounded at tip.

NEW SPECIES OF COLEOPTERA I.*

BY W. J. BROWN,

Ottawa, Ont.

Coelambus columbianus n. sp.

Length 3.6-4 mm.; width 1.7-1.9 mm. Elongate oval, subequally narrowed in front and behind. Dorsum very dark brown, the anterior portion of the head pale brown, a median band extending across the pronotum sometimes slightly paler, elytra near basal and lateral margins sometimes very slightly paler; antennae reddish-yellow, the segments except the basal four each strongly infusate except at base; legs and prothoracic venter reddish-yellow; remainder of venter black, shining.

Head finely alutaceous, finely and sparsely punctate. Pronotum rather closely punctate; the punctures rather coarse near the margins, finer elsewhere; closer and coarser than usual throughout.

Elytra without trace of cloudings; closely and rather coarsely punctured, the series of coarser punctures not evident.

Metasternum almost impunctate at middle, coarsely and closely punctate on the sides. Posterior coxae finely and closely punctate between the coxal lines; the coxal plates coarsely and closely punctate, each with a strongly alutaceous, impunctate area on the posterior margin. Abdomen closely punctate, finely so at middle, coarsely so on the sides. Femora and tibiae simple, of the usual type.

Male. Anterior and middle tarsi strongly dilated, their second segments much wider than the first or third, fully nine-tenths as wide as their respective tibiae; anterior protarsal claw somewhat shorter and stouter than the other, more strongly curved near base. Surface polished and shining throughout, the venter just visibly alutaceous.

Shining female. Anterior and middle tarsi not dilated, their first three segments equal in width. Polished and sculptured like the male.

Opaque female. Dorsum opaque throughout, very finely and densely alutaceous. Metasternum and coxal plates distinctly alutaceous. Other characters as in the shining female.

Holotype.—♂, Copper Mountain, B. C., August 23, 1929, (G. Stace Smith); No. 3107 in the Canadian National Collection, Ottawa.

Allotype.—Shining ♀, same data, May 25, 1929.

Morphotype.—Opaque ♀, same data as holotype, September 20, 1929.

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

Paratypes.—25 ♂, 6 shining ♀, 6 opaque ♀, same data as holotype, collected on various dates during April, May, June, August, September and October 1929.

This species is notable for the very dark color and the coarseness and closeness of the pronotal and elytral punctures. In Mr. Fall's table, it traces to *patruelis* or *obscuraplgiatus*, and like the latter, resembles *compar* superficially. In *columbianus* there is no trace of a dark cloud on the elytra as in *patruelis* and *obscuraplgiatus*.

***Agabus smithi* n. sp.**

Length 6.9-7.4 mm.; width 3.6-3.9 mm. Moderately elongate, oval. Black; antennae pale rufous, each segment except the basal four or five infusate at apex; labrum rufous, more or less infusate; palpi pale rufous with infusate apices; femora and abdominal segments more or less rufescent at their apices, the former sometimes feebly so throughout; tibiae and tarsi pale rufous; elytra brownish, becoming yellowish near the basal and lateral margins.

Head sometimes with feeble traces of two pale spots on the vertex. Pronotum without pale areas.

Elytra very finely reticulate; the meshes of the reticulation evidently unequal at middle near base, less unequal near the sides and apex; the punctules very fine and inconspicuous, occurring within the meshes.

Prosternal process narrow, very strongly angulate in cross section. The shortest distance between the meso-coxal cavities and the meta-coxal plate exactly half the length of the latter. Hind tibia with punctures along the inner margin, these forming a row which usually extends beyond the middle and sometimes to apex, very rarely the punctures reduced to two or three in number and confined to basal third.

Male.—Pro- and mesotarsi feebly dilated. Protarsal claws slightly elongate, similar, the inner margin of each straight to a point near the apex.

Female. Similar in sculpture to and not less shining than the male.

Holotype.—♂, Copper Mountain, B. C., June 29, 1929, (G. Stace Smith); No. 3106 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data, June 22, 1929.

Paratypes.—11 ♂, 12 ♀, same data, collected on various dates during May, June, July and August, 1929.

This species keys to and is very closely allied to *inscriptus*, agreeing perfectly with the latter in elytral sculpture, in the characters of the pro- and mesosternum, and in sexual characters. It differs from *inscriptus* in possessing more numerous punctures on the inner margin of the meta-tibia. In *inscriptus* and other closely allied species, these punctures are very few in number and only very rarely form a row which extends to the middle of the tibial margin. In addition, *smithi* is very distinctly paler in color than all examples of a considerable series of *inscriptus* from various localities at the western end of the Straits of Belle Isle, *smithi* agreeing perfectly with *discolor* in the color of the elytra and legs. Mr. Fall makes no reference to such color differences between *inscriptus* and *discolor* in his review of the species of *Agabus*, and the Sudbury, Ontario, specimen of the former, which he records in that paper, agrees with *discolor* in

these characters. However, the dark specimens at hand show the normal coloration of the species in Canadian Labrador and must, on the basis of descriptions, be referred to *inscriptus*.

***Agathidium canadensis* n. sp.**

Length (body extended in life-like attitude) 2 mm.; width 1.3 mm. Broadly oval, moderately convex; feebly contractile. Dorsum dark brownish red; the elytra in scutellar region, pronotum at middle, and head blackish; metasternum and abdomen black, underside of prothorax and legs brownish-red; antennae reddish, the clubs black.

Head finely and sparsely but distinctly punctate throughout; frontal suture not visible; clypeus not prolonged beyond the sides of the front, truncate, without membranous margin; labrum very small, deeply emarginate; mandibles rather prominent; seventh and eighth antennal segments equal.

Pronotum twice as wide as long, strongly narrowed in front, the apex moderately emarginate; hind angles subrectangular and rather broadly rounded; the puncturation uniform, very fine and sparse and very indistinct.

Elytra very slightly longer than wide, equal in width to pronotum, just visibly widened behind the humeri, the sides almost parallel in basal third. Humeral angle obtuse but distinct. Sutural stria distinctly impressed in apical half, indicated basally by a row of punctures; punctures of the disk fine, very distinct, and sparse, becoming closer on the sides, the three or four most internal striae feebly indicated by rows of slightly less fine punctures.

Intercostal process of mesosternum horizontal, continuous with and in the same plane as the metasternum, suddenly becoming vertical at the anterior margin of the coxae, the apex of this declivity with a very obtuse tooth, the coxae narrowly separated. Metasternum and abdomen finely, rather closely, and very distinctly punctate.

Male. Left mandible larger, prolonged at apex but not produced into a horn. Front and middle tarsi 5-segmented; hind tarsi 4-segmented.

Female. Mandibles simple. Front tarsi 5-segmented; middle and hind tarsi 4-segmented.

Holotype.—♂, Britannia, Ont., June 8, 1928, (W. J. Brown); No. 2878 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data as holotype.

Paratype.—♀, same data as holotype.

This peculiar species has very definite affinities with *Leiodes* but must be placed in *Agathidium* on account of the antennal characters. The structure of its mesosternum is almost exactly that of *Leiodes globosa* Say, and its contractile power is but little more developed than in that species. The species is more elongate than most species of *Agathidium*. It traces to the *sexstriatum* group in Horn's table and may be recognized by the characters already noted, the elytral puncturation and the sexual characters. The type series was collected from debris left by the receding flood waters of the Ottawa river.

***Rhipiphorus columbianus* n. sp.**

Length 5 mm. Body clothed throughout with sparse, inconspicuous, pale brownish hairs. Color black, shining; elytra yellow, blackish at base, polished;

mandibles except at base and palpi yellow; male with anterior tibiae, tarsi, and apical two-thirds of anterior femora pale yellow, the middle tibiae and middle and hind tarsi yellow but heavily infusate, apex of pygidium with small elongate yellow spot.

Head finely, rather closely punctate. Pronotum finely, closely punctate; a small circular area on each side of middle near base, a larger elongate median area in front of middle, and a small elongate area on each side impunctate. Mesonotum impunctate, tumid at middle near posterior margin, deeply concave on each side in posterior half. Elytra finely, sparsely, and indistinctly punctate, without alutaceous sculpture.

Dorsum of abdomen with first segment impunctate in median third, elsewhere finely and rather closely punctate; second segment impunctate except for a small area on each side which is punctate like the first; intermediate segments coarsely and closely punctate, narrowly impunctate along median line and the anterior margins; pygidium with sparse, indistinct punctures at sides and base.

Entire ventral surface closely punctate, the punctures moderately coarse on the abdomen, a little finer elsewhere. Tibiae and tarsi slender. First segment of anterior tarsus very slightly longer than the three following, distinctly shorter than the fifth. First segment of middle tarsus slightly longer than the three following which are equal to the fifth. First segment of posterior tarsus slender, not strongly compressed, only slightly thicker than the second but equal in length to all the following together, emarginate above at apex.

Male. Color of legs as described above. Antennae bilabellate. Vertex strongly and conically elevated between the bases of the antennae; median line of front narrowly excavated in upper half. Wings not infusate.

Female. Legs blackish. Antennae pectinate, the rami increasing in length toward the apex, the second ramus with a short branch near its apex. Wings with a large brownish cloud at middle. Pygidium much larger as usual.

Holotype.—♂, Lillooet, B. C., July 12, 1919; No. 2945 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

This species is closely allied to *californicus* and traces to the latter in LeConte's table (Trans. Am. Ent. Soc., VIII, 210). It is distinguished primarily by the form of the first segment of the hind tarsus. In *californicus* this segment is three times as long as wide, in the present species it measures fully five times as long as wide when viewed from the side. In addition, the type of *californicus* lacks definite impunctate areas on the pronotum and the pygidium is coarsely, strongly and closely punctate.

***Helmis arizonica* n. sp.**

Length 3.4 mm.; width 1.4 mm. Elongate oval, moderately convex; clothed with brownish hairs; uniformly blackish with distinct aeneous lustre, antennae and tarsi pale brownish yellow.

Head closely, finely punctate. Prothorax four-fifths as long as wide, gradually narrowed anteriorly; side margins very feebly sinuate before the hind angles, very feebly arcuate; front angles produced, very acute; disc without impressions, moderately coarsely punctate, the punctures separated by little more than their own diameters at middle, dense near the side margins.

Elytra parallel in basal half, arcuate at middle and then oblique and straight to apex; elytral striae scarcely impressed, closely punctate, the punctures fine near the suture and becoming coarse toward the sides; intervals flat, very finely and sparsely punctate.

Metasternum at middle with sparse, moderately coarse punctures; abdomen densely, moderately coarsely punctate.

Holotype.—Diamond Creek, White Mts., Ariz., June, (D. K. Duncan); No. 2968 in the Canadian National Collection, Ottawa.

This species is closely allied to *concolor* but differs in size, color, and pronotal puncturation. In the type of *concolor*, the pronotal punctures are much less close at middle, being separated by fully twice their own diameters; the humeri are pale; and the length is 4.2 mm.

***Limnius trivittatus* n. sp.**

Length 2.1 mm.; width 1.1 mm. Oval, moderately convex, fulvo-pubescent. Piceous with distinct aeneous lustre; each elytron with a sutural and an oblique discal stripe pale yellow; the sutural stripe including the entire sutural interval at base, gradually narrowed toward apex and extending to apical third; the discal stripe extending from humerus almost to apex, widest at the humeral angle, strongly narrowed at basal third, then again wider and parallel apically.

Antennae yellow, as long as the width of the head across the eyes. Head opaque, microscopically and very densely alutaceous, without distinct punctures.

Pronotum three-fourths as long as wide; the side margins moderately arcuate. Disk narrowly alutaceous and subopaque on the sides, elsewhere finely punctate, the punctures separated by at least their own diameters. Basal striae not strong, one-fourth as long as the pronotum; pronotal base without a fovea on each side of the ante-scutellar emargination.

Elytral length 1.5 times the width, the sides moderately arcuate; striae feebly impressed, closely and coarsely punctured; intervals feebly convex, without distinct punctures.

Holotype.—Knowlton, Que., July 7, 1929, (L. J. Milne); No. 3077 in the Canadian National Collection, Ottawa.

The form of this species is exactly that of *ovalis*. It may be known by its trivittate elytra.

***Cyphon confusus* n. sp.**

Length 3.8-4 mm.; width 1.7-1.8 mm. Body moderately elongate, parallel. Color black, the basal segments of antennae, mouth parts, extreme apices of the femora, trochanters, tibiae, and tarsi reddish-yellow; pronotal coloration variable, in the holotype blackish at middle and broadly rufous on the sides; in one paratype similar but with the median dark area paler and reduced to a small cloud near the anterior margin, in the third specimen dark brown throughout. Dorsum clothed with reddish-yellow hairs.

Antennae exactly twice as long as the width of the head across the eyes; the third segment as wide as and distinctly longer than the second, these segments combined slightly but distinctly longer than the fourth. Head sparsely, very finely punctate.

Pronotum exactly twice as wide as long, two-thirds as wide as the elytra; the hind angles rectangular, distinctly rounded; the side margins not explanate; disk finely but very distinctly, rather sparsely punctate, the punctures strongly impressed and regularly distributed throughout.

Elytra two-thirds as wide as long, parallel; rather coarsely and closely, regularly punctate; the disk without costae. Ventral surface finely and closely punctate throughout.

Male. Antennae slender; terminal abdominal segment broadly and feebly impressed at middle.

Holotype.—♂, Knowlton, Que., July 11, 1929, (L. J. Milne); No. 3108 in the Canadian National Collection, Ottawa.

Paratypes.—2♂, Knowlton, Que., July 2, 1928, (J. A. Adams).

This species will not follow Horn's key (Trans. Am. Ent. Soc., VIII, 105) but is likely to be confused with *ruficollis* and *collaris*. In *ruficollis*, the antennae are longer and have the second and third segments together much shorter than the fourth; in *confusus* the male antennae are slender as in the female of *ruficollis*. In *collaris*, the legs are darker and the pronotal punctures are very sparse and indistinct. In form, *confusus* is more elongate than *collaris* and less so than *ruficollis*.

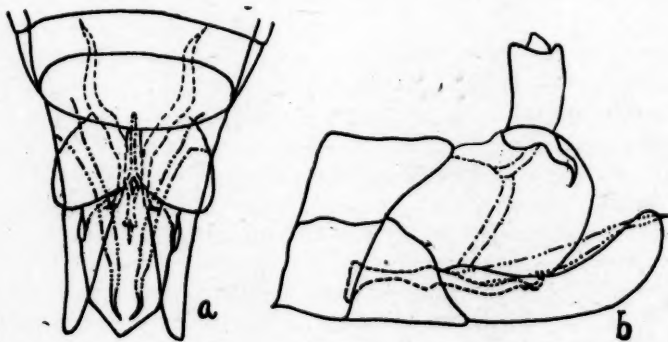
A NEW SPECIES OF BEAN LEAFHOPPER FROM HAITI

BY DWIGHT M. DELONG,
Ohio State University.

***Empoasca fabalis* n. sp.**

Resembling *fabae* in size, form and appearance, but with distinct genital characters. Size 3 mm.

Vertex strongly produced about one third its length before anterior margins



(a) Ventral view of ♂ genitalia showing internal pieces in situ. (b) Lateral view of same. --- style --- oedagus - - - - lateral processes of pygophers.

of eyes. One third wider between eyes than length at middle. Pronotum one-third longer than vertex.

Color pale green without distinct markings. Usually with irregular mottling and varying longitudinal stripes, white. A pair of oblique dark green spots either side of and back of apex.

Genitalia: Female last ventral segment roundly produced and entire. Male valve twice as long as preceding segment, posterior margin almost truncate. Plates long and narrow, gradually tapered to rather acute tips, more than twice as long as valve.

Male internal genital structures: In ventral view styles short, slender, very narrow at apices which are bent outwardly. Lateral process of pygofer long and tapered. Apical fifth very narrow and slightly bent inwardly (in ventral view). Dorsal spines of pygofer heavy at base but rapidly narrowed to ventrally directed and slightly anteriorly hooked processes.

Holotype.—Male labeled Port-au-Prince, Haiti, June 18, 1929.

Described from a series of more than sixty specimens collected at Port-au-Prince, Haiti, April 15 and June 18, 1929 by Dr. R. C. Smith. He reports these as extremely abundant upon beans and sweet potatoes and the most important species of economic leaf hopper in Haiti upon truck crops. This species is closely related to *fabae* and apparently replaces it as an economic pest in this area. It has long been cited under the name *fabae* which species apparently does not occur in the tropics if we may judge from available material.

PHENACOCOCCUS WILMATTAE CKLL.

BY ELMER D. BUEKER,

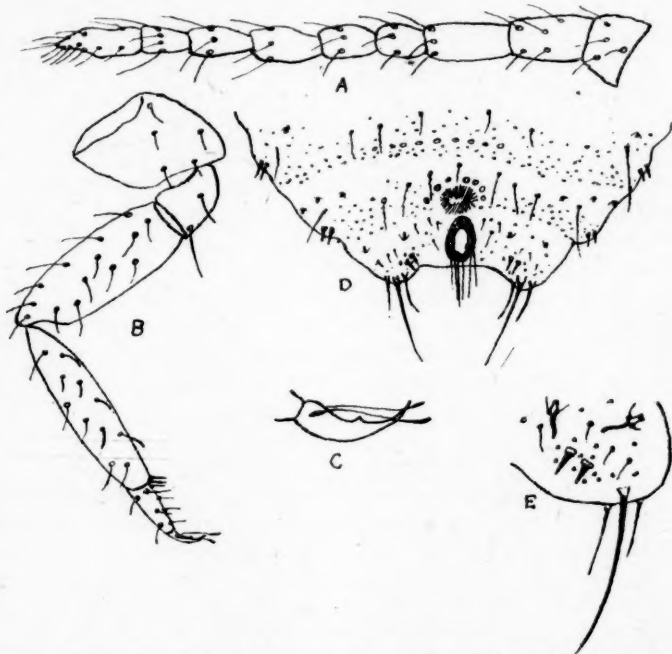
University of Colorado, Boulder, Colo.

On May 23, 1929 a species of *Phenacoccus* was found in ant's nests of the genus *Lasius*. Some of these were feeding on the roots of grass and were well guarded by the ants. Mature males were also found in the nest. After going carefully through the literature I find that it agrees well with the description of *P. wilmattae* Ckll. However, since a number of very obvious characters were omitted in the original description it will be profitable to mention them, and emphasize the outstanding differences between this species and *P. stachyos* Ehrhorn.

1. A few long hairs are cephalad to the mouth parts and a few are on the basal segments of the abdomen.
2. Trochantral spines vary from 90 mu to 100 mu in length.
3. Length of hind tibia 224 mu, width 49 mu, as against hind tibia of *P. stachyos*, length 336 mu, width 28 mu.
4. Mesothoracic leg: Trochanter and femur 238 mu long, width 84 mu; tibia 154 mu long, width 40 mu; tarsus 70 mu long, 28 mu wide. Mesothoracic leg of *P. stachyos*: Trochanter and femur 322 mu long, width 70 mu; tibia 280 mu long, width 34 mu; tarsus 98 mu long, width 25 mu.
5. Antennae: (1) 42 mu, (2) 56 mu, (3) 49 mu, (4) 28 mu, (5) 28 mu, (6) 28 mu, (7) 30 mu, (8) 30 mu, (9) 54 mu. Antennae of *P. stachyos*: (1) 56 mu, (2) 84 mu, (3) 112 mu, (4) 70 mu, (5) 74 mu, (6) 42 mu, (7) 40 mu, (8) 40 mu, (9) 70 mu.

6. Conical prominences projecting from each anal lobe in specimens observed are never more than two. Number of conical prominences are therefore less numerous than those of *P. stachyos*.

The antennae and legs of *P. wilmatiae* Ckll. are shorter and stouter than those of *P. stachyos* Ehrhorn. This species comes close to *P. stachyos* but is very distinct from it, and it may be very easily distinguished by the remarkably thick hind tibiae. The tibia of the other legs are of ordinary size.



A. antennae; B. hind leg; C. tarsal claw of hind leg; D. posterior segments of abdomen; E. anal lobe.

LITERATURE

- Cockerell, T. D. A. "The New Mexico Coccidae of the Genus *Ripersia*," Annals and Magazine of Natural History. VIII, p. 57. (1901).
Ferris, G. F. "The California Species of Mealy Bugs." Stanford University Press. 1918.

Mailed Monday, April 28th, 1930.

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